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13. SUPPLEMENTARY NOTES

Last Author is John Riedener

14. ABSTRACT

This poster describes the Army-funded exploratory work in progress at the Target Behavioral Response Laboratory. The final objective of the project is to develop data-based general approaches to modeling and simulation of human behavior and quantitative methods of verification and validation. Crowd behavior data were collected under controlled laboratory conditions. Mathematical models of human behavior were derived which were then coded into computational models to produce predicted paths. These processes allow visual comparisons between outputs from simulations and behavioral data collected in the laboratory from human subjects. The results of these preliminary efforts will initiate further work in the methods of incorporating human behavioral data into models and validation procedures.

15. SUBJECT TERMS

data, human behavior, model building, verification, validation, crowd simulation, non-lethal weapons, Target Behavioral Response Laboratory

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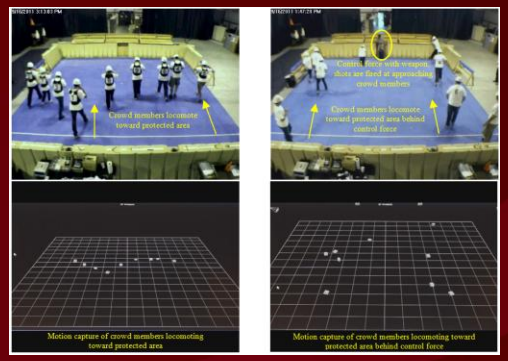
The Armament Research Development & Engineering Center

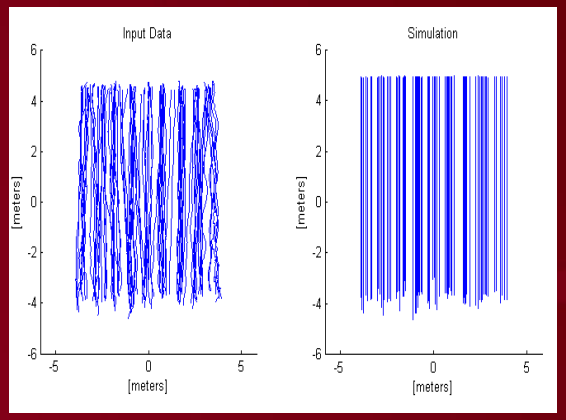
Innovative Armaments Solutions for Today and Tomorrow

Data-Driven Modeling of Target Human Behavior in Military Operations

E. Mezzacappa, G. Cooke, G. Reid, R. DeMarco, C. Sheridan, & J. Riedener *Army's Target Behavioral Response Laboratory*



Crowd behavior data were collected under controlled laboratory conditions.



The MSE for the baseline model was 0.2523.

Mathematical models of human behavior were derived which were then coded into computational models to produce predicted paths.

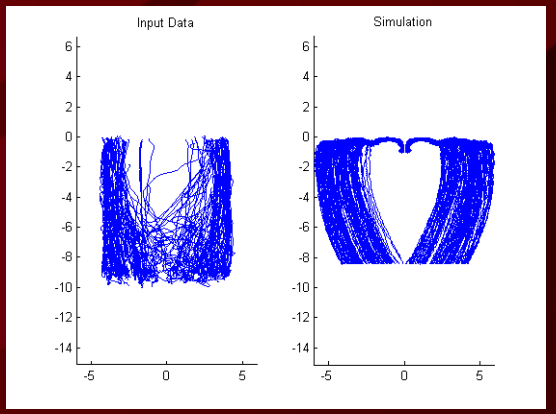
$$\vec{B} = f(p, e)$$

$$\vec{B} = \vec{G_1} + \vec{G_2} + \cdots + \vec{G_n}$$

$$\overrightarrow{G_{Target}} = \begin{bmatrix} \Delta X \\ \Delta Y \end{bmatrix} = [\alpha] \begin{bmatrix} p \\ e \end{bmatrix} = [\alpha] \begin{bmatrix} x_i \\ y_i \\ x_G \\ y_G \\ \vdots \\ M \end{bmatrix}$$

$$\overrightarrow{G_{Weapon}} = \begin{bmatrix} \Delta X \\ \Delta Y \end{bmatrix} = [\beta] \begin{bmatrix} p \\ e \end{bmatrix} = [\beta] \begin{bmatrix} x_i \\ y_i \\ x_G \\ y_G \\ \vdots \\ M \end{bmatrix}$$

$$\vec{B} = \vec{G_1} + \vec{G_2} = \overrightarrow{G_{Target}} + \overrightarrow{G_{Weapon}}$$



MSE was 0.4191 and 0.2958 for model fit of the radial and tangential components

"Lab to laptop" experimental data-based general approaches to M&S of human behavior